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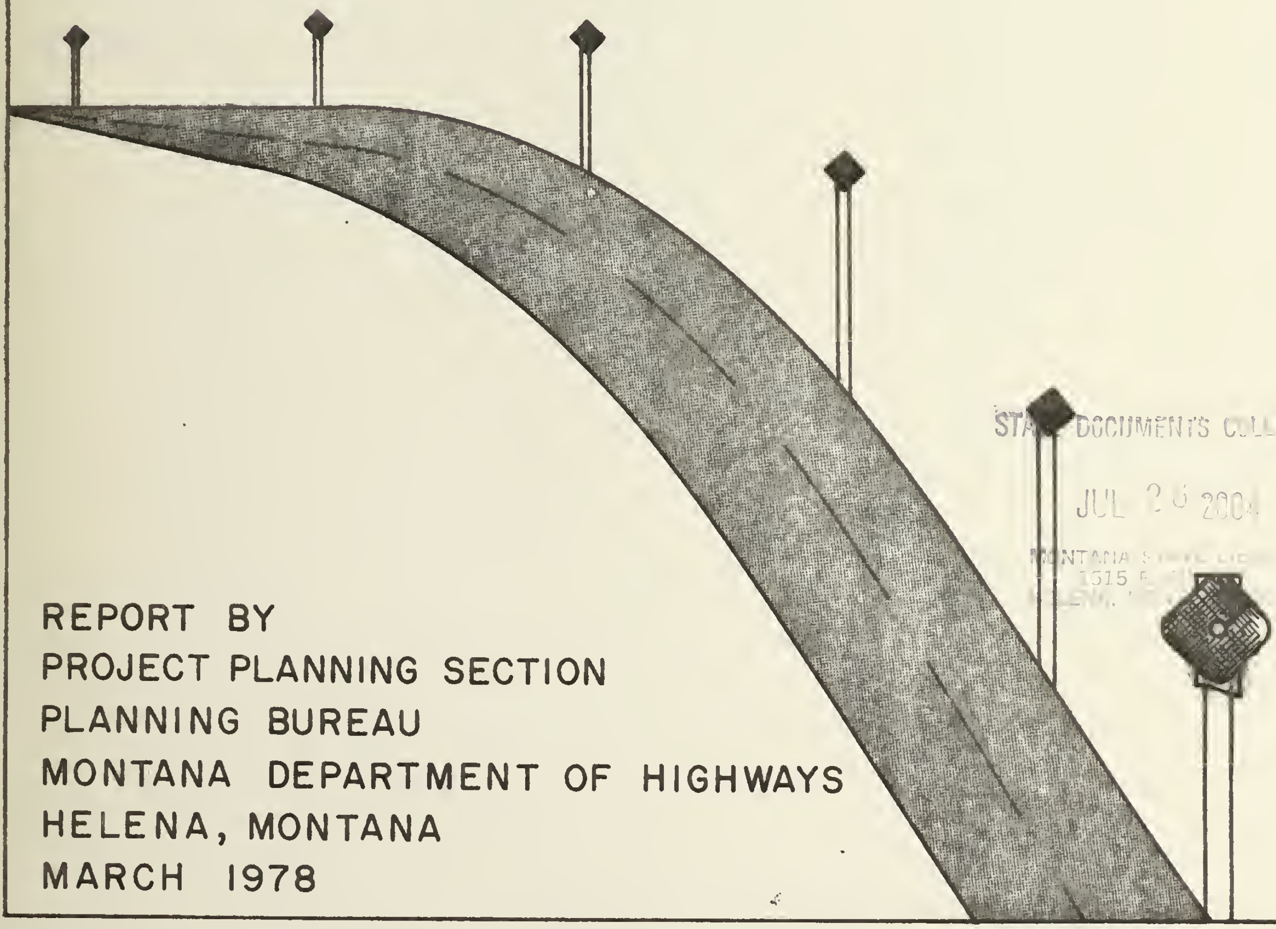
DELINEATION STUDY

FERGUS COUNTY
AND
JUDITH BASIN COUNTY



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REPORT BY
PROJECT PLANNING SECTION
PLANNING BUREAU
MONTANA DEPARTMENT OF HIGHWAYS
HELENA, MONTANA
MARCH 1978

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INTRODUCTION

The installation of post mounted delineators in the counties of Fergus and Judith Basin was implemented on July 9, 1974 and completed on August 9, 1974. Post mounted delineators were installed at thirteen roadway locations consisting of tangent sections and delineated curved sections of less than four degrees for a total of 164.1 miles. Curves greater than four degrees were delineated prior to this study. The Department of Highways Maintenance Division was not informed that the area was to be a special study area, therefore no additional or special maintenance was performed. A daytime speed limit of 55 mph was put into effect statewide in March 1974.

This report specifically documents the findings of an evaluation on the effectivensss of post mounted delineators on reducing the total accidents, nighttime accidents and nighttime run-off-the-roadway accidents.

SUMMARY

The following findings are based on a two county delineation program with equal time amounts of before and after accident experience. The accident study period used before and after was two and one-half years. It was felt that for the lengths of time involved the weather conditions were comparable for the before and after study periods. The roadway in the study was Federal Aid Primary 2-lane highway, and delineation was the only roadway improvement during the time period. Total accidents, nighttime accidents and run-off-the-roadway accidents were evaluated for their accident reduction for each study area. Each category of accidents was individually evaluated and then evaluated as a total project.

The results of the findings are as follows:

1. The installation of delineators resulted in a reduction of 22% of the overall accident rate and 23% of the number of total accidents, both of which were statistically significant at the 95% level.

2. The installation of delineators resulted in a reduction of 33% in the nighttime accident rate and 32% in the number of nighttime accidents, both of which were statistically significant at the 99% level.

3. The installation of delineators resulted in a reduction of 26% in the nighttime run-off-the-roadway accident rate and 24% in the number of nighttime run-off-the-roadway accidents, both of which were statistically significant at the 90% level.

In all of the above cases the number of accidents and accident rates increased for the total statewide primary system in the same time period.

4. In nine (9) of the thirteen (13) areas evaluated, total, nighttime, nighttime run-off-the-roadway accidents and accident rates were reduced.

INSTALLATION

The post mounted delineators were installed on both sides of the roadway surface at 300 foot spacing and standard curve spacing using centerline project stationing. The work performed was contracted. Total contract price was $50,777.77. The delineators are maintained by Department of Highways maintenance personnel. No special consideration was given in maintaining these areas.

The delineators installed were Design F, silver bi-directional, and mounted on 7 foot posts.

EVALUATION OF THE PROJECT

The objectives of the study were:

1. Determine the effect of the delineation on total accidents and total accident rates.
2. Determine the effect of the delineation on nighttime accidents and nighttime accident rates.
3. Determine the effect of the delineation on nighttime run-off-the-roadway accidents and nighttime run-off-the-roadway accident rates.

The "Before and After Study" method was used to evaluate the effectiveness of the project. The procedure calls for the collection of data pertinent to the information sought, immediately before and after the improvement is made. The average daily traffic for the project site was obtained using automatic traffic volume counters. Two and one-half years of accident history was taken for the before and after periods from accident listing computer printout sheets. Statistical analysis for the accident data employed the Poisson technique.

METHODOLOGY

This document utilizes before accident data, after accident data which was adjusted for changes in ADT and accident rates together with percent reductions subsequent to delineation, to determine if there are statistically significant reductions. Formulas used to calculate adjusted accident numbers and accident rates are presented below. Significance levels were determined from the charts presented in this document. The Poisson Technique was employed in determining the significance level.

The following formula was used to calculate percent change:

$$\text{Percent Change} = \frac{X - Y}{X} \times 100$$

where : X = number of accidents before

Y = adjusted number of accidents after, which is calculated by the following equation:

$$\frac{\text{ADT Before}}{\text{ADT After}} \times \text{Number of after accidents}$$

OR

X = accident rate before

Y = accident rate after

In this case rates are already adjusted for differences in ADT.

The following formula was used to calculate accident rates:

$$\text{Accident Rate} = \frac{\text{\# Accidents} \times 1{,}000{,}000}{\text{ADT} \times \text{Length of Section} \times \text{No. Years} \times 365}$$

where:

ADT = Average Daily Traffic

CONCLUSIONS

Using the methods described herein it has been determined statistically that the installation of post mounted delineators has significantly reduced the number of accidents on these sections of roadway. The accidents were reduced in nine of the thirteen areas studied (see following tables) as well as reducing the number of accidents for the entire project.

APPENDIX

STUDY SECTIONS
SHOWING ACCIDENT NUMBERS

HIGHWAY NUMBER	LOCATION	LENGTH OF SECTION	ADT		BEFORE ACCIDENTS			AFTER ACCIDENTS			AFTER ACCIDENTS ADJUSTED FOR ADT		
	MP. To MP.		Before	After	Total	Night	ROR & NT	Total	Night	ROR & NT	Total	Night	ROR & N
P-43	3.3-12.7	9.4	1,026	1,067	15	9	6	20	13	9	19.2	12.5	8.7
P-43	16.0-34.8	18.8	291	300	24	14	6	6	4	1	5.8	3.9	1.0
P-43	86.0-42.4	6.4	298	287	1	0	0	6	2	1	6.2	2.1	1.0
P-57	7.2- 9.2	2.0	1,368	1,403	4	0	0	3	3	2	2.9	2.9	1.9
P-57	10.3-21.0	10.7	1,205	1,320	34	18	12	17	8	7	15.5	7.3	6.4
P-57	21.6-32.6	11.0	1,199	1 288	34	13	6	22	9	5	20.5	8.4	4.7
P-57	33.0-42.5	9.5	1,363	1,465	23	9	5	24	5	2	22.3	4.7	1.9
P-57	47.3-54.1	6.8	1,284	1,301	16	7	4	8	1	1	7.9	1.0	1.0
P-57	67.5-80.0	12.5	1,587	1,600	34	18	9	44	18	12	43.6	17.9	11.9
P-61	27.7-87.3	59.6	356	382	44	22	7	50	16	6	46.6	14.9	5.6
P-63[1]	19.5-22.5	3.0	820	892	5	2	0	6	1	0	5.5	0.9	0.0
P-63	23.6-36.6	13.0	768	856	16	4	3	14	8	5	12.6	7.2	4.5
P-63	37.6-39.0	1.4	859	955	4	1	0	4	2	2	3.6	1.8	1.8
AVERAGE TOTALS		164.1	956	1,089	254	117	61	224	90	53	196.6	79.0	46.5

[1] Some surface improvements were completed in this area in 1973.

STUDY SECTIONS
SHOWING ACCIDENT RATES

HIGHWAY NUMBER	LOCATION	LENGTH OF SECTION	ADT		BEFORE ACCIDENT RATE			AFTER ACCIDENT RATE		
	MP. To MP.		Before	After	Total	Night	ROR & NT	Total	Night	ROR & NT
P-43	3.3-12.7	9.4	1,026	1,067	1.70	1.02	0.68	2.19	1.42	0.98
P-43	16.0-34.8	18.8	291	300	4.82	2.80	1.20	1.18	0.78	0.19
P-43	36.0-42.4	6.4	298	287	0.57	0.00	0.00	3.59	1.19	0.60
P-57	7.2- 9.2	2.0	1,368	1,403	1.61	0.00	0.00	1.18	1.17	0.78
P-57	10.3-21.0	10.7	1,205	1,320	2.89	1.53	1.02	1.32	0.62	0.54
P-57	21.6-32.6	11.0	1,199	1,288	2.83	1.08	0.50	1.75	0.70	0.39
P-57	33.0-42.5	9.5	1,363	1,465	1.96	0.76	0.42	1.97	0.39	0.16
P-57	47.3-54.1	6.8	1,284	1,301	2.02	0.88	0.50	1.00	0.12	0.12
P-57	67.5-80.0	12.5	1,587	1,600	1.85	0.99	0.50	2.41	0.99	0.66
P-61	27.7-87.3	59.6	356	382	2.27	1.14	0.36	2.40	0.77	0.29
P-63[1]	19.5-22.5	3.0	820	892	2.23	0.89	0.00	2.49	0.41	0.00
P-63	23.6-36.6	13.0	768	856	1.75	0.44	0.33	1.40	0.77	0.49
P-63	37.6-39.0	1.4	859	955	3.64	0.91	0.00	3.30	1.64	1.64
AVERAGE TOTALS		164.1	956	1,089	1.76	0.82	0.43	1.37	0.55	0.32

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[1] Some surface improvements were completed in this area in 1973.

TABLE 1 SIGNIFICANCE OF REDUCTIONS BY ACCIDENT NUMBERS

	TOTAL ACCIDENTS			NIGHT ACCIDENTS			NIGHTTIME AND RUN-OFF-THE-ROAD			LEVEL OF SIGNIFICANCE		
	Before	After*	Percent Reduct.	Before	After*	Percent Reduct.	Before	After*	Percent Reduct.	Total	Night	Night & ROR
STUDY AREA	254	196.6	22.6	117	79.0	31.7	61	46.5	23.8	95%	99%	90%
STATEWIDE PRIMARY ROADS	4,668	4,781.7	+2.4	1,932	2,047.1	+6.0	1,092	1,141.7	+4.6			

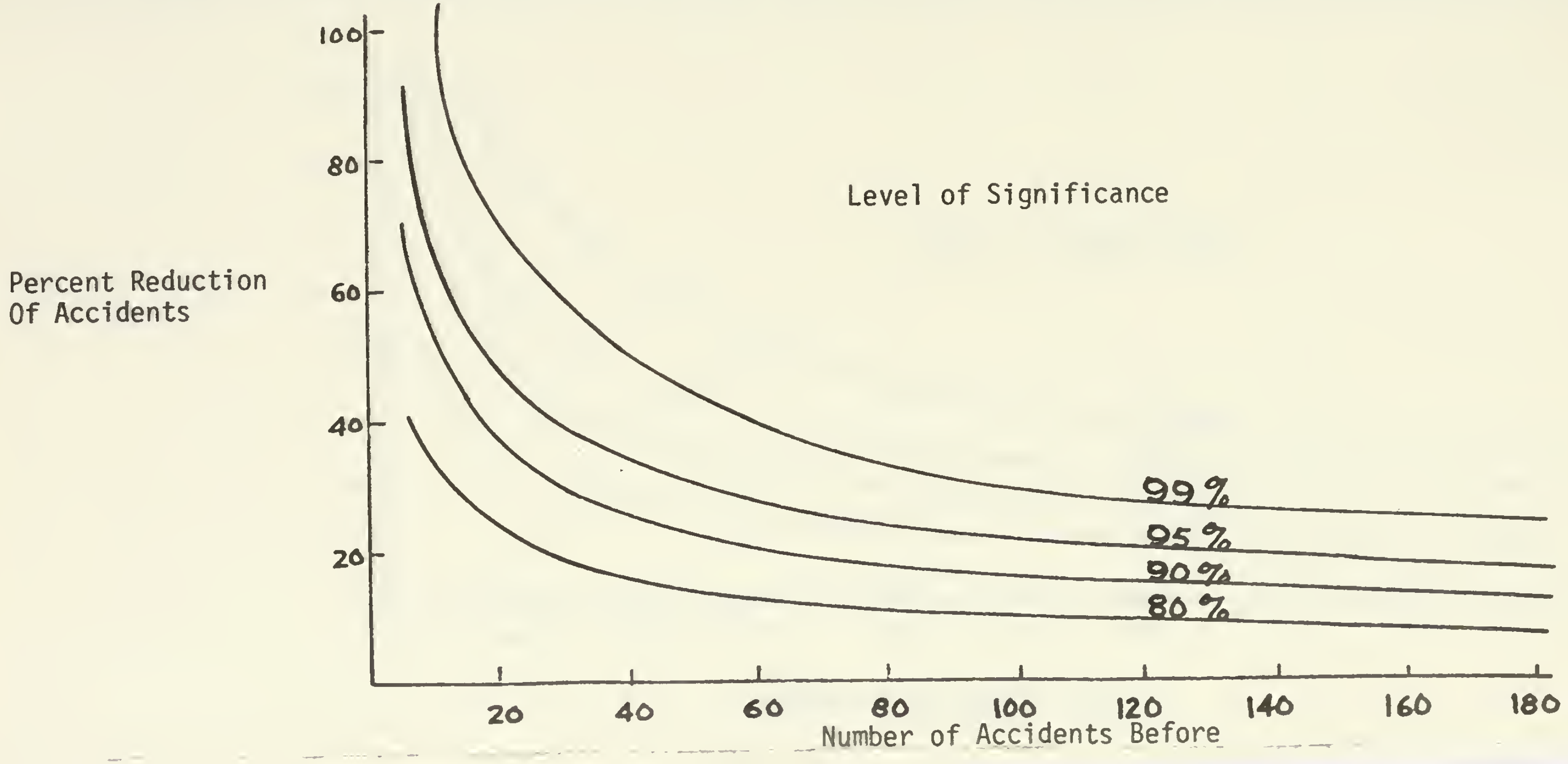

TABLE 2 SIGNIFICANCE OF REDUCTIONS BY ACCIDENT RATE

	TOTAL ACCIDENTS			NIGHT ACCIDENTS			NIGHTTIME AND RUN-OFF-THE-ROAD			LEVEL OF SIGNIFICANCE		
	Before	After*	Percent Reduct.	Before	After*	Percent Reduct.	Before	After*	Percent Reduct.	Total	Night	Night & ROR
STUDY AREA	1.76	1.37	22.2	0.82	0.55	32.9	0.43	0.32	25.6	95%	99%	90%
STATEWIDE PRIMARY ROADS	2.5	2.6	+2.4	1.05	1.11	+7.9	0.59	0.62	+5.1